perpendicular to said diameter, the diameter of the center panel is less that 1.835 inches (46.6 mm) and the opening has an area of less than 0.5 square inches (323 mm^2) and an aspect ratio of between 1.3 and 1.7.

REMARKS

Claim 1 is amended to conform it to customary U.S. format, to employ Americanized spellings, to change the word "having" to "including," to emphasize the improved flow characteristics of Applicant's end, and to correct the Section 112 rejection by deleting the parenthetical text. Attached is a version of claim 1 indicating the modifications.

The pending claims have been rejected under Section 103 based on United States Patent Number 5,711,448 ("Clarke") in view of PCT Publication WO 96/37414 ("Carnaudmetalbox") and further in view of Publication EP 432 569 ("Schmalbach") or admitted prior art. Applicant respectfully submits that the prior art and conventional thinking teach away from the suggested combination and that one of the references provides no evidence for the feature for which it is cited. Further, Applicant submits test data demonstrating unexpected results. Applicant requests reconsideration of the pending rejection.

1. The Prior Art Taken As A Whole Teaches Away From The Asserted Combination

Applicant's claim 1 recites a can end having (among other things) an opening having a maximum area (that is, less than 0.5 in^2), and a particular opening configuration, as defined by the aspect ratio of the opening. Applicant's inventive end enhances pouring characteristics, such as providing fewer flow rate fluctuations of diminished amplitude, an improved flow rate profile (such as improved characteristics immediately after pouring begins), and significantly diminishing the time period for emptying a

container, compared with a conventional opening configuration of identical opening area. Thus, Applicant's invention enables the pour characteristics of small ends to approach that of larger ends, and thereby facilitates the reduction of end diameter.

Unlike Applicant's claimed end, as explained in Applicant's background section, the end disclosed in Clarke generally has a relatively large opening area, which feature is generally considered beneficial to pouring characteristics. Clarke expressly states the desirability of a "larger opening," which Clarke defines as between 0.5 in^2 and 0.7 in^2:

> As used in this specification, a "*larger opening*" is an opening area defined by the tear panel in the range of approximately *0.5-0.75 square inch*, which has been found *desirable in can ends having a diameter in the range of about 202-211*, . . .
> (Clarke, col. 2, lines 9-14; italics added).

Other than stating that openings larger than 0.5 in^2 "are formed within can ends for either aesthetic reasons or to ensure greater pourability and drinkability" (Clarke, col. 2, lines 6-9), Clarke is silent on pouring characteristics of openings. Clarke, in fact, is directed not to flow characteristics of the opening, but rather with the mechanical aspects of opening the tear panel of a larger diameter end.

In this regard, after explaining that the problems of non-turnunder and insufficient opening "are exacerbated as larger openings are formed with can ends" (Clarke, col. 2, lines 1-7), Clarke lists three objects of the invention – the first two of which are related only to shearing of the tear panel. The third object expressly states that Clarke's object relates to the mechanical problems associated with larger openings (that is, openings larger than those claimed by Applicant):

> A further object is to *facilitate the use of larger size openings* in beverage container ends without encountering the problems of non-turnunders and insufficient angles.
> (Clarke, col. 2, lines 33-35; italics added).

Clarke, considered as a whole and based on its express object "to facilitate the use of a larger size opening" (that is, one having an area of at least 0.5 in^2), would lead an end manufacturer or designer toward employing a larger opening.

Thus, considering Clarke's silence on the flow characteristics of its opening and the explicit statement that its object relates to mechanical opening properties of the tear panel for ends larger than 0.5 in^2 opening area, a person considering designing smaller ends and optimizing flow characteristics of smaller ends having an opening area less than 0. 5 in^2 would not look to Clarke. Notwithstanding general statements relating to its opening's suitability to other sizes, and considering the reference as a whole, Clarke, in fact, teaches away from reducing the opening size below 0.5 in^2.

To emphasize the pour characteristics of Applicant's invention relative to Clarke, Applicant amends the preamble of claim 1 to recite that the end has "improved flow characteristics." Applicant submits that such amendment does not limited the scope of any limitation of the claim, but rather emphasizes the improved flow rate characteristics of Applicant's claimed invention. In summary, while Clarke is directed merely to improving mechanical aspects, Applicant's end improves the flow characteristics of the closure, such as by reciting an aspect ratio between 1.3 and 1.7.

The Office Action acknowledges that Clarke does not teach Applicant's claimed aspect ratio of 1.3 to 1.7, but relies on Schmalbach and Applicant's specification for purportedly disclosing such range. However, rather than disclosing the claimed range, Schmalbach's Abstract is silent regarding the aspect ratio. Further, Applicant submits attached Exhibit 3, which is a published English translation of the claims of Schmalbach, which likewise are silent regarding the aspect ratio.

Based on Schmalbach's silence regarding the aspect ratio, the Office Action apparently, but inappropriately, relies on measurements or proportions from the figures of Schmalbach to determine the aspect ratio. *See* Office Action, page 3, paragraph 2 (referring to dimensions "about the opening in Figure 1"). M.P.E.P. § 2125 expressly states that proportions of features in a drawing are not evidence of actual proportions when the drawings are not to scale. As there is nothing in Schmalbach that indicates that its figures are drawn to scale, Schmalbach must be considered to teach or suggest nothing relating to the proportions of its figures, and therefore nothing relating to the aspect ratio of its opening. If there are other grounds on which to assert that Schmalbach discloses a

particular aspect ratio, Applicant requests that the Examiner expressly set forth the grounds.

The Office Action also states that Applicant's specification refers to a conventional end having an aspect ratio of 1.47, but that end (represented as end A in Figure 3) not only has an opening area of 0.596 in^2 -- that is, much larger than Applicant's claimed area limitation – but also has a center panel greater than 1.835 inches. As explained above with respect to the Clarke reference, the prior art teaches away from reducing the opening size to below 0.5 in^2. A single data point -- showing only an aspect ratio within the claimed range but having both an opening area outside of the claimed range and a panel diameter outside the claimed range -- does not provide a motivation to combine, especially considering Clarke's teaching away from reducing the opening area. Moreover, as explained in the attached Declaration of Mr. Brian Fields, prior to the Applicant's discovery and invention, the conventional thinking at the time the invention was made led away from employing the claimed aspect ratio range and toward a substantially circular geometric shape. As explained in Paragraph 5 of Mr. Field's Declaration, a geometric shape approaching a circle was considered to provide the best combination of open area and good flow parameters. Further, a slot-shape was generally considered to be not preferred because of the inherent difficulties in drinking from a slot-shape opening – including the fact that the pursed lips of some drinkers may not be wide enough to fully cover the slot, which could result in dribbling. Thus, the conventional thinking led away from an aspect ratio greater than about 1.1

Considering that Clarke provides no teaching relating to pour characteristics and generally guides toward employing an opening larger than 0.5 in^2, that Schmalbach provides no evidence relating to aspect ratio, and that the conventional thinking at the time of Applicant's invention taught away from employing the claimed aspect ratio, Applicant submits that the art taken as a whole teaches away the claimed combination and that there is no incentive to combine the references. For at least the above reasons, the pending claims are allowable.

2. Data Demonstrates That Applicant's Claimed Invention Provides Unexpectedly Beneficial Flow Characteristics

Applicant submits the attached figure (Exhibit 1) that includes additional data emphasizing the unexpectedly beneficial pour characteristics provided by Applicant's end. The enclosed Exhibit 1 repeats the graph of flow rate versus time for end curves A, B, and C from Figure 3 (as-filed), and adds an additional plot for an end labeled in the attached Figure as end D. Exhibit 2 is a diagram of the opening of inventive ends B and D. Inventive end D, which employs both an aspect ratio and an opening area that are within the ranges recited in Applicant's claim 1, has identical opening area (0.450 square inches) as conventional end C, which has an aspect ratio outside of Applicant's claimed range.

A comparison of the flow characteristics of ends D and C, which openings differ only by geometry and not by size, demonstrates the improved flow characteristics of Applicant's end. The ordinate of the attached graph shows constant units of time that are uniform for each plot A through D.[1] The test data demonstrates the superior flow characteristics of Applicant's end according to the following parameters: diminished total time for emptying the container; smoother flow and more consistent flow rate (that is, fewer glugs and diminished amplitude glugs); and higher peak flow and improved inrush characteristics (that is, flow characteristics immediately after rotating a can from its vertical position). The attached Exhibit 1 and discussion below demonstrate the unexpected results and/or reflect an unexpectedly large magnitude of improvement.

The total time for emptying the container for Applicant's end D is approximately 40 time units, compared with approximately 50 time units for conventional end C. The 20 percent reduction in total emptying time is attributable to the claimed aspect ratio, as (again) the opening area of end C is identical to that of end D. Such twenty percent reduction in total emptying time alone demonstrates unexpectedly beneficial results.

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[1] The data logging equipment employed for the test specifically states the real time of the units, but the total span of the ordinate is approximately 5 second.

Moreover, the magnitude of the flow rate variations over most of the time span of inventive end curve D compared with conventional end curve C illustrates an additional unexpected result: Applicant's claimed end produces smoother or more consistent flow rate over time. Specifically, the number of glugs, reflected in the number of local peaks of the respective curves, and the magnitude of the glugs, reflected by the average local amplitude of the peaks, for inventive end D is significantly improved relative to those of conventional end C. Fewer glugs and lower amplitude glugs mean smoother flow.

Also, the inventive end D not only provides a higher peak flow rate than conventional end C (11.06 g/unit time compared with 9.67 g/unit time, respectively – a 14% improvement), but also reaches the peak flow rate significantly faster than does end C (21 time increments compared with 28 time increments, respectively -- a 25% improvement). Moreover, the first local peak flow rate for end D (measured at time increment 5) is 9.79 g/unit time, which is nearly double the first local peak flow rate of conventional end C, 4.92 g/unit time (measured at only time increment 2). The flow rate at the first local peak of end D is even approximately 50 % larger than the second peak of conventional end C: 9.79 g/unit time compared with 6.53 g/unit time (both measured at time increment 5). Achieving higher local and absolute peak flow rate in a shorter time, and delaying the beginning of glugging mean improved inrush characteristics.

The graph of flow rate versus time for Applicant's end D is similar to that for Applicant's end B (as clear from Exhibit 1), which illustrates the effectiveness of Applicant's claimed aspect ratio range.

Regarding the discharge time of Figure 3, the Office Action cites a rudimentary volumetric flow equation and states that to adjust the area to control the flow is within the skills of one of ordinary skill in the art. The volumetric flow equation does not, however, account for the problem of glugging, the non-steady-state nature of the opening and pouring process, the time to reach peak flow rate, the magnitude of the peak flow rate, nor the inrush characteristics. Neither the volumetric flow rate equation nor merely adjusting the area to control the flow account for the improved pour characteristics of Applicant's invention. The twenty percent reduction in total emptying time, smoother flow, and improved inrush because of Applicant's claimed configuration (compared, of

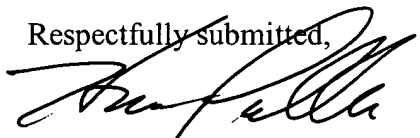
course, to a convention configuration of identical area), demonstrates the weak influence that the volumetric flow equation bears on Applicant's invention and illustrates the inventiveness of Applicant's claimed invention.

CONCLUSION

As the art taken as a whole teaches away from combining the features of Applicant's claims and considering the unexpected, beneficial pour characteristics resulting from such combination, Applicant respectfully submits that the pending claims are in condition for allowance. Favorable reconsider of the pending rejections is respectfully requested.

If the Examiner determines that a telephone conference would further prosecution of this case, he is invited to telephone the undersigned at his convenience.

Respectfully submitted,



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VERSION WITH MARKINGS TO SHOW CHANGES MADE

1. (Amended) An easy open can end <u>having improved flow characteristics, said end</u> comprising:

a circular [centre] <u>center</u> panel with a rupturable score line therein, the score line defining the periphery of a non-removable tear panel,

a non-detachable tab [having] <u>including</u> a nose portion and a rear portion; and a connection between the tab and the [centre] <u>center</u> panel which acts as a pivot about which the tab can be rotated out of the plane of the [centre] <u>center</u> panel, such that in use, the rear portion of the tab is lifted to cause the nose portion of the tab to press down on the tear panel, thereby rupturing the score line and swinging the rear panel out of the plane of the [centre] <u>center</u> panel to create an opening, the opening [having] <u>including</u> a major axis and a minor axis, the minor axis located at a diameter of the [centre] <u>center</u> panel and the major axis located perpendicular to said diameter, [characterized in that] the diameter of the [centre] <u>center</u> panel is less that 1.835 inches (46.6 mm) and the opening has an area of less than 0.5 square inches (323 mm^2) and an aspect ratio [(major axis : minor axis)] of between 1.3 and 1.7.